

SECRET

Declass Review by NGA.

SECRET

GROUP 1
EXCLUDED FROM AUTOMATIC DOWNGRADING
AND DECLASSIFICATION

CONTRACT FILE

PAR 232

7
Proj # 5049

AUTOMATED EDGE TRACE DEVICE

9 October 1964

PROJECT AUTHORIZATION REQUEST

PAR 232

9 Oct 64

SUBJECT: Automated Edge Trace Device

TASK/PROBLEM

1. Design, fabricate and test an automatic device to refine data and reduce labor required in evaluation of image quality in photographic images by the measurement of edge density contours.

PROPOSAL

2. The evaluation of image quality (MTF) in aerial photographs from edge density contour measurement has become a useful tool for photo intelligence operations. The evaluation procedure has been developed using a laboratory microdensitometer to measure the edge density contours. The handling of roll form photo material and the conversion of the density contour data into form for computer input are difficult and time-consuming operations on this equipment.

3. In this project, it is proposed to develop a specialized edge trace apparatus to automate as many of the operations as possible in order to:

- a. Improve the accuracy of the data.
- b. Reduce the labor required.
- c. Provide safer handling of valuable photographic film.

4. System Requirements: Design an instrument to satisfy the specific needs for measuring edge density contours in roll form aerial photographs. The instrument will contain the following features:

- a. Film rewinds and an illuminated viewer integral with the instrument to permit convenient selection of photo images for edge scanning. Provision for image location by grid coordinates should also be provided.
- b. Means to photograph the selected image area with a system for identifying the photograph with the related edge density contour data.
- c. Means for a 0.5 to 2.0 millimeter scan across a selected edge in any direction relative to the length of the film roll at any position on

PAR 232

9 Oct 64

the film without skewing a section of the film relative to the direction of its motion between the supply and takeup spools.

d. A system for indicating the optimum focus setting of the scanning optical system.

e. A system for indicating the optimum alignment of the scanning slit to the edge being scanned.

f. A data output system which can provide either:

(1) A graphical record.

(2) A digital record of the edge density contour. Present computer programs for deriving MTF from the edge density contour require "hand smoothing" of a graphical record to eliminate grain "noise" before generating digital data for computer input. Studies are in progress to develop computer programs capable of eliminating the grain noise and which could, therefore, accept digital data directly from the instrument.

5. General Approach:

a. Phase I of the proposed project will include:

(1) Design studies, fabrication and testing of a breadboard opto-mechanical system for edge scanning at any orientation to the film edge over a 0.5 to 2.0 millimeter range at any position on the film.

(2) Incorporation of a physical focus-indication device operating upon the "grain-scan" principle described by Lamberts and Straub¹.

(3) Development effort to provide an opto-electro-mechanical system for physical indication of best photo-image vs scanning-slit alignment.

(4) Consideration will be given to the use of fluid-gate techniques and oil immersion microscope optics to reduce the instrument spread function below that currently available in laboratory microdensitometers. The basic optical system of the edge scanner will be that described by Altman and Stultz for the control of stray light in their microdensitometer.²

¹R. L. Lamberts and C. Straub in a paper presented before the May 1964 conference of SPSE.

²J. H. Altman and K. F. Stultz: RSI Vol. 27, 1033-1036, December 1956.

PAR 232
9 Oct 64

b. Successful completion of Phase 1 and receipt of authorization to proceed with Phase 2 will be followed by design, fabrication and testing of an instrument expected to be suitable for routine use in image evaluation measurements of roll film photography in 70mm to 8.5 inch widths and lengths up to 250 feet.

PROGRAM OBJECTIVES

6. Program objectives are:

a. Phase 1:

(1) Through breadboard design, fabrication, testing and evaluation, determine feasibility.

(2) Publish interim and final reports with conclusions and recommendations.

(3) Supply briefing aids.

b. Phase 2:

(1) Design, fabricate, test and evaluate an automated instrument suitable for routine use in image evaluation.

(2) Supply briefing aids.

(3) Publish interim and final reports.

(4) Publish service manual.

SCHEDULE

7. A tentative schedule covering major phases of effort is shown in Figures 1 and 2. The time span indicated to complete the subject program is based on actual start of work. Upon approval to proceed and/or start of work, schedule will be reviewed and necessary changes reported as required. Upon completion of Phase 1, necessary changes to Phase 2 schedule (see Fig. 2) will be submitted with request to proceed with Phase 2.

Tentative Schedule

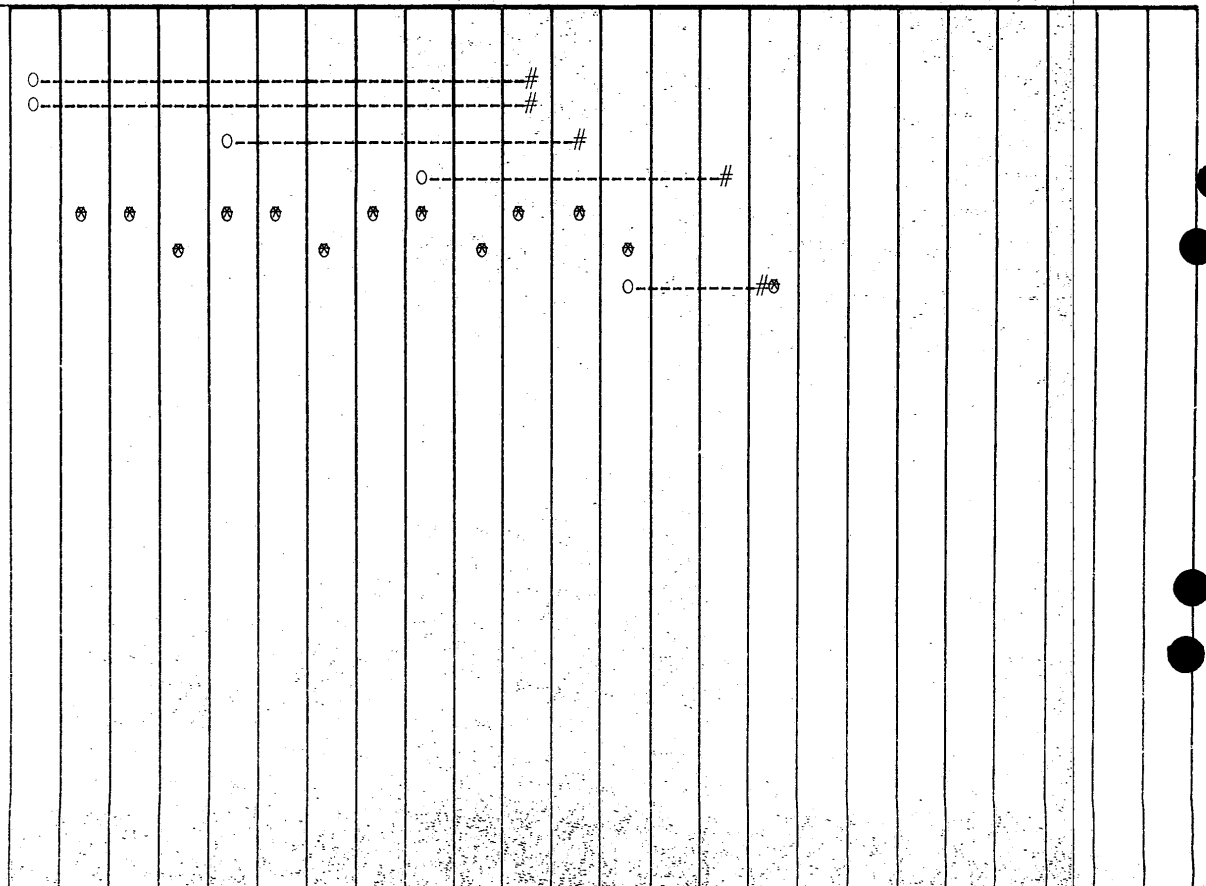
PAR 232
9 Oct 64

Automated Edge Trace Device
Phase 1

MONTHS

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

1. Engineering & Design
 - a. Opt. - Mech.
 - b. Electrical
2. Fabricate
3. Test and Evaluate
4. Informal Reports
5. Quarterly Reports
6. Final/Interim Reports



KEY: O - Start
- Complete
⊗ - Deliver

Automated Edge Trace Device
Phase 2

Tentative Schedule

PAR 232
9 Oct 64

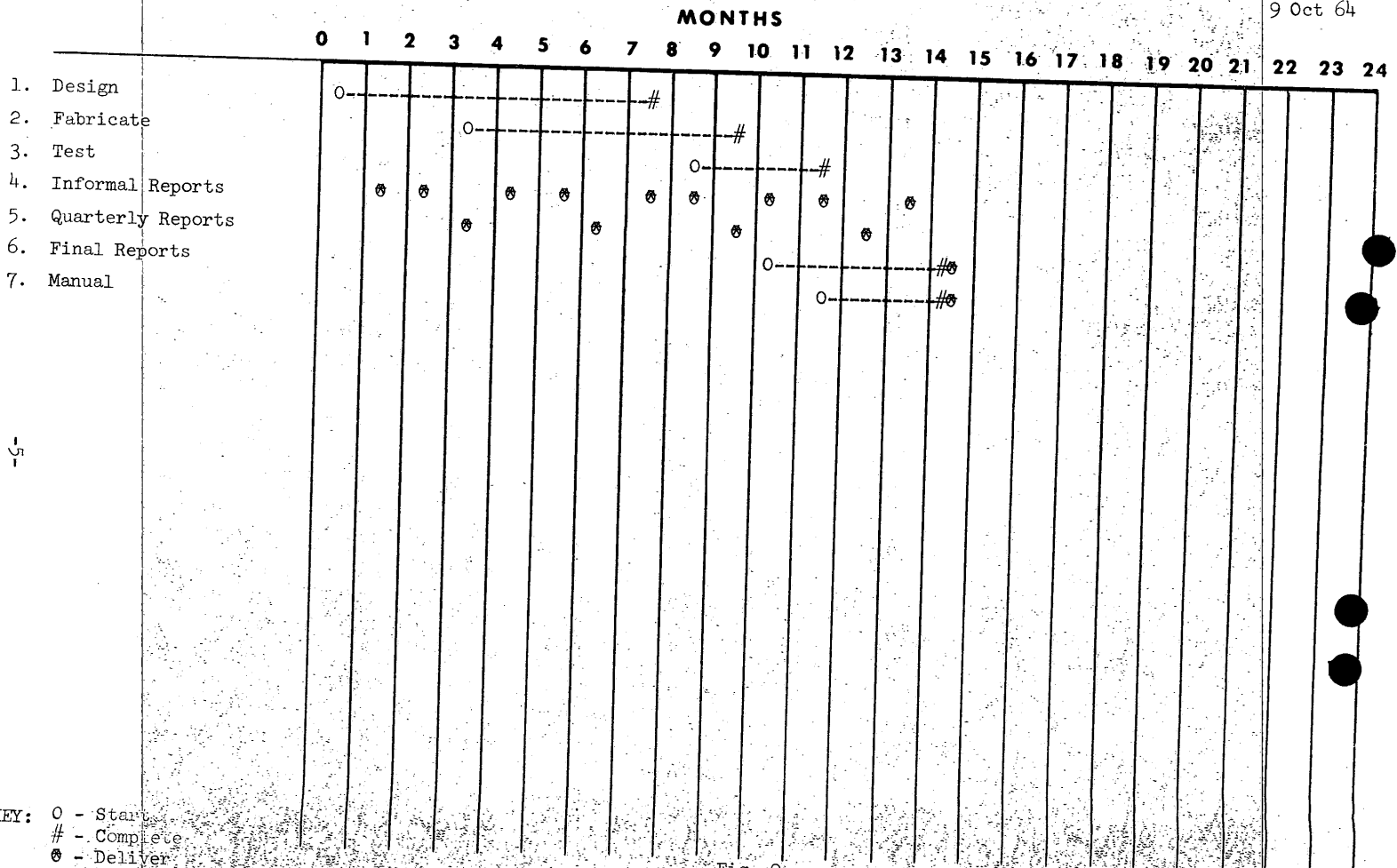


Fig. 2